

IN THE CLAIMS:

Please cancel claims 1-40 without prejudice or disclaimer, and substitute new claims 41-80 therefor as follows:

Claims 1-40 (Cancelled).

41. (New) A method of determining the location of a mobile terminal in a given area, comprising the steps of:

including said mobile terminal both in a satellite-based positioning system and in a cellular communications system, whereby said mobile terminal is adapted to receive satellite signals from said satellite-based system and to be covered by at least one cell of said cellular communications system; and

determining at least approximately the coordinates of said mobile terminal based on both satellite signals received from said satellite-based system and information related to said cellular communications system, wherein said coordinates include an altitude coordinate and an estimate of said altitude coordinate derived from said information related to said cellular communications system.

42. (New) The method of claim 41, further comprising the steps of:

providing a geographical data base comprising data base items associated with a given set of bi-dimensional positioning coordinates of said mobile terminal in said area corresponding to values for said altitude coordinate; and

accessing said geographical data base via said mobile terminal whereby said positioning coordinates, as at least approximately determined by said mobile terminal

based on said satellite signals, are refined via the information derived from said geographical data base.

43. (New) The method of claim 41, comprising the steps of:

identifying, in said cellular communications system, at least one base station proximate to said mobile terminal, said proximate base station having an associated altitude coordinate; and

using the altitude coordinate of said proximate base station as said estimate of said altitude coordinate.

44. (New) The method of claim 41, comprising the steps of:

identifying, in said cellular communications system, a plurality of base stations adjacent to said mobile terminal, each said adjacent base station having a respective altitude coordinate;

determining the minimum of said altitude coordinates for said adjacent base stations; and

using said minimum value as said estimate of said altitude coordinate.

45. (New) The method of claim 41, comprising the steps of:

identifying, in said cellular communications system, a plurality of base stations adjacent to said mobile terminal, each said adjacent base station having a respective altitude coordinate;

determining an average value for said respective altitude coordinates over said adjacent base stations; and

using said average value as said estimate of said altitude coordinate.

46. (New) The method of claim 45, comprising the steps of:

performing power measurements providing, for each said adjacent base station,
a respective power value for said mobile terminal; and

determining said average value as a weighted average of said respective altitude
coordinates values, the weighting being a function of said power values determined for
each said adjacent base station.

47. (New) The method of claim 41, wherein said positioning coordinates are
determined in an iterative manner by subsequent location steps, a new refined estimate
of said altitude coordinate being used at each step in said iterative process.

48. (New) The method of claim 41, comprising the steps of:
providing an approximate bi-dimensional positioning of said terminal on the basis
of said information related to said cellular communications system; and

determining said positioning coordinates of said mobile terminal on the basis of
said satellite signals by exploiting said bi-dimensional positioning and said estimate of
said altitude coordinate.

49. (New) The method of claim 48, wherein said determining step comprises:
initially determining a search area for positioning coordinates of said mobile
terminal based on said satellite signals and said estimate of said altitude coordinate;
and

subsequently identifying said positioning coordinates within said search area
based on information related to said cellular communications system.

50. (New) The method of claim 49, comprising the steps of:
defining the search area for said positioning coordinates in the form of a
hyperbolic set of points; and

determining said positioning coordinates within said hyperbolic set of points by using said information related to said cellular communications system.

51. (New) The method of claim 42, comprising the steps of:

determining a first set of values for said location coordinates on the basis of said information related to said cellular communications system;

acquiring said satellite signals from said satellite-based system and deriving therefrom an area likely to include the mobile terminal;

providing a new set of values of said location coordinates by:

i) effecting, based on said information related to said cellular communications system, a bi-dimensional positioning of said mobile terminal within said area likely to include the mobile terminal; and

ii) accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate.

52. (New) The method of claim 51, comprising the steps of:

determining the distance between said new set of values of said location coordinates and said first set of values for said location coordinates; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, starting an iterative process wherein said area likely to include the mobile terminal is re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of affecting said bi-dimensional positioning, accessing said

geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate are repeated, wherein said steps of bi-dimensional positioning are effected over said re-defined area.

53. (New) The method of claim 52, wherein said iterative process comprises the steps of:

determining the distance between the sets of values of said location coordinates as available before and after the current iteration step; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, running a further iteration step wherein said area likely to include the mobile terminal is further re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of effecting said bi-dimensional positioning, accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate and are further repeated, wherein said step of bi-dimensional positioning is effected over said further re-defined area.

54. (New) The method of claim 41, comprising the step of determining at least approximately said coordinates based on satellite signals received from less than three satellites of said satellite-based system.

55. (New) An arrangement comprising:

a satellite-based positioning system;

a cellular communications system;

at least one mobile terminal adapted to receive in a given area satellite signals from said satellite-based system and to be covered by at least one cell of said cellular communications system; and

at least one processing module configured for determining at least approximately the coordinates comprising an altitude coordinate, of said mobile terminal based on both satellite signals received from said satellite-based system and information related to said cellular communications system, said at least one module being configured for deriving an estimate of said altitude coordinate from said information related to said cellular communications system.

56. (New) The arrangement of claim 55, comprising a geographical data base including data base items associated with a given set of bi-dimensional positioning coordinates of said mobile terminal in said area corresponding values for said altitude coordinate, said at least one module being configured for accessing said geographical data base whereby said positioning coordinates as at least approximately determined based on said satellite signals are refined via the information derived from said geographical data base.

57. (New) The arrangement of claim 55, wherein:

said cellular communications system comprises at least one base station proximate to said mobile terminal, said proximate base station having an associated altitude coordinate; and

said at least one module is configured for using the altitude coordinate of said proximate base station as said estimate of said altitude coordinate.

58. (New) The arrangement of claim 55, wherein:

said cellular communications system comprises a plurality of base stations adjacent to said mobile terminal, each said adjacent base station having a respective altitude coordinate; and

said at least one module is configured for using as said estimate of said altitude coordinate one of the minimum of said altitude coordinates for said adjacent base stations and an average value for said respective altitude coordinates over said adjacent base stations.

59. (New) The arrangement of claim 58, wherein said at least one module is configured for performing power measurements providing, for each said adjacent base station, a respective power value for said mobile terminal, and determining said average value as a weighted average of said respective altitude coordinates values, the weighting being a function of said power values determined for each said adjacent base station.

60. (New) The arrangement of claim 55, comprising at least one module configured for determining said positioning coordinates in an iterative process by subsequent location steps, a new refined estimate of said altitude coordinate being used at each step in said iterative process.

61. (New) The arrangement of claim 55, comprising at least one module configured for:

providing an approximate bi-dimensional positioning of said terminal on the basis of said information related to said cellular communications system; and

determining said positioning coordinates of said mobile terminal on the basis of said satellite signals by exploiting said bi-dimensional positioning and said estimate of said altitude coordinate.

62. (New) The arrangement of claim 61, comprising at least one module configured for:

initially determining a search area for positioning coordinates of said mobile terminal based on said satellite signals and said estimate of said altitude coordinate; and

subsequently identifying said positioning coordinates within said search area based on information related to said cellular communications system.

63. (New) The arrangement of claim 62, comprising at least one module configured for:

defining the search area for said positioning coordinates in the form of a hyperbolic set of points; and

determining said positioning coordinates within said hyperbolic set of points by using said information related to said cellular communications system.

64. (New) The arrangement of claim 56, comprising at least one module configured for:

determining a first set of values for said location coordinates on the basis of said information related to said cellular communications system;

acquiring said satellite signals from said satellite-based system and deriving therefrom an area likely to include the mobile terminal; and

providing a new set of values of said location coordinates by:

i) effecting, based on said information related to said cellular communications system, a bi-dimensional positioning of said mobile terminal within said area likely to include the mobile terminal; and

ii) accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate.

65. (New) The arrangement of claim 64, comprising at least one module configured for:

determining the distance between said new set of values of said location coordinates and said first set of values for said location coordinates; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, starting an iterative process wherein said area likely to include the mobile terminal is re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of effecting said bi-dimensional positioning, accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate and are repeated, wherein said steps of bi-dimensional positioning is effected over said re-defined area.

66. (New) The arrangement of claim 65, comprising at least one module configured for running said iterative process by:

determining the distance between the sets of values of said location coordinates as available before and after the current iteration step; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, running a further iteration step wherein said area likely to include the mobile terminal is further re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of effecting said bi-dimensional positioning, accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate are further repeated, wherein said step of bi-dimensional positioning is effected over said further re-defined area.

67. (New) A mobile terminal for use in a satellite-based positioning system and a cellular communications system, the mobile terminal being adapted to receive in a given area satellite signals from said satellite-based system and to be covered by at least one cell of said cellular communications system, at least one mobile terminal comprising: a processing module configured for determining at least approximately the coordinates, comprising an altitude coordinate of the mobile terminal in said area, based on both satellite signals received from said satellite-based system and information related to said cellular communications system, and wherein said processing module is configured for deriving an estimate of said altitude coordinate from said information related to said cellular communications system.

68. (New) The mobile terminal of claim 67, wherein the terminal is adapted to be operatively associated with a geographical data base including data base items associated with a given set of bi-dimensional positioning coordinates of said mobile terminal in said area corresponding values for said altitude coordinate, and said mobile terminal is configured for accessing said geographical data base, whereby said positioning coordinates as at least approximately determined by said mobile terminal based on said satellite signals are refined via the information derived from said geographical data base.

69. (New) The mobile terminal of claim 67, wherein the altitude coordinate of a proximate base station in said cellular communications system is used as said estimate of said altitude coordinate.

70. (New) The mobile terminal of claim 67, wherein one of the minimum of altitude coordinates for a plurality of adjacent base stations in said cellular communications system and an average value for said respective altitude coordinates over said adjacent base stations is used as said estimate of said altitude coordinate.

71. (New) The mobile terminal of claim 70, wherein the terminal is configured for performing power measurements providing, for each said adjacent base station, a respective power value for said mobile terminal, and determining said average value as a weighted average of said respective altitude coordinates values, the weighting being a function of said power values determined for each said adjacent base station.

72. (New) The mobile terminal of claim 67, wherein the terminal is configured for determining said positioning coordinates in an iterative manner by subsequent

location steps, a new refined estimate of said altitude coordinate being used at each step in said iterative process.

73. (New) The mobile terminal of claim 67, wherein the terminal is configured for:

providing an approximate bi-dimensional positioning of said terminal on the basis of said information related to said cellular communications system; and

determining said positioning coordinates of said mobile terminal on the basis of said satellite signals by exploiting said bi-dimensional positioning and said estimate of said altitude coordinate.

74. (New) The mobile terminal of claim 73, wherein the terminal is configured for:

initially determining a search area for positioning coordinates of said mobile terminal based on said satellite signals and said estimate of said altitude coordinate; and

subsequently identifying said positioning coordinates within said search area based on information related to said cellular communications system.

75. (New) The mobile terminal of claim 67, wherein the terminal is configured for:

defining the search area for said positioning coordinates in the form of a hyperbolic set of points; and

determining said positioning coordinates within said hyperbolic set of points by using said information related to said cellular communications system.

76. (New) The mobile terminal of claim 67, wherein the terminal is configured for:

determining a first set of values for said location coordinates on the basis of said information related to said cellular communications system,

acquiring said satellite signals from said satellite-based system and deriving therefrom an area likely to include the mobile terminal;

providing a new set of values of said location coordinates by:

i) effecting, based on said information related to said cellular communications system, a bi-dimensional positioning of said mobile terminal within said area likely to include the mobile terminal; and

ii) accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate.

77. (New) The terminal of claim 76, wherein the terminal is configured for:
determining the distance between said new set of values of said location coordinates and said first set of values for said location coordinates; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, starting an iterative process wherein said area likely to include the mobile terminal is re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of effecting said bi-dimensional positioning accessing said geographical data base and associating to the bi-dimensional positioning coordinates of

said mobile terminal within said area a corresponding value for said altitude coordinate are repeated, wherein said steps of bi-dimensional positioning is effected over said re-defined area.

78. (New) The mobile terminal of claim 77, wherein the terminal is configured for running said iterative process by:

determining the distance between the sets of values of said location coordinates as available before and after the current iteration step; and

comparing said distance with a threshold indicative of the degree of accuracy pursued in the location action; and

if said distance is higher than said threshold, running a further iteration step wherein said area likely to include the mobile terminal is further re-defined on the basis of said satellite signals from said satellite-based system and the latest value available for said altitude coordinate and said steps of effecting said bi-dimensional positioning, accessing said geographical data base and associating to the bi-dimensional positioning coordinates of said mobile terminal within said area a corresponding value for said altitude coordinate and are further repeated, wherein said step of bi-dimensional positioning is effected over said further re-defined area.

79. (New) A computer program product adapted to be directly loadable in the memory of at least one computer and including software code portions for performing the method of any one of claims 41 to 54.

80. (New) A computer program product adapted to be directly loadable in the memory of a computer and including software code portions for implementing the mobile terminal of any one of claims 67 to 78.